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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

VINH, LAN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 04/08/2003

12

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/671,201

Applicant(s)

SANO, MICHIAKI

Examiner

Lan Vinh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 January 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 32-34 and 41-62 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 32-34 and 41-62 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 09/671201.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language

2. Claims 32-34 are rejected under 35 U.S.C. 102(b) as being anticipated by Berglund et al (US 5,250,165)

Berglund discloses a method for isotropically reactive ion etching a contact. This method comprises the steps of:

etching the film 23 by using a mask layer/photoresist film 24 as a mask (col 5, lines 26-28; fig. 2)

one the etching is completed, removing by etching/ashing the film 24 with a shunted DC bias power source 11 to highly isotropically etch through the resist film 24, a high RF amplitude may be used to control DC bias 11, fig. 3 of Berglund shows that the etching step etches through halfway of resist film 24 (col 4, lines 58-60; col 5, lines 31-54). This reads on ashing the film with a first high frequency biasing power level substantially halfway through the resist film after etching

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The total silence of Berglund about applying a second high frequency bias power level after ashing with the shunted bias/first biasing power level reads on applying a second biasing power level equal to zero after ashing with the first biasing power level.

Regarding claims 33-34, Berglund discloses using the photoresist film 24 as a mask to form a specific pattern at a silicon dioxide/organic film formed on the substrate/workpiece (col 5, lines 11-13)

3. Claims 52-59 are rejected under 35 U.S.C. 102(e) as being anticipated by Yang (US 6,218,084)

Yang discloses a method for removing photoresist layer 204 covering a layer 202 formed on a substrate placed in a chamber, the layer 202 has an opening 208 and a fence portion 206 expand/distending toward the upper portion and edge of the opening 208 (fig. 2A). This method comprises the steps of:

etching the substrate/workpiece (col 3,lines 3-5)

applying bias power/high frequency power for biasing to the wafer/substrate at a first power level (300 W) to strip/remove portion 206 formed during etching (col 3, lines 37-42)

generating/raising the processing gas to a plasma (col 3, lines 36-40)

eliminating the bias power/high frequency power for biasing before removing the photoresist completely (col 3, lines 43-45) reads on stopping the application of the high frequency bias power before removing the photoresist completely

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using the same processing gas of oxygen/addtional gas before and after stopping the application of bias power (col 3, lines 18-41)

Regarding claim 53, Yang discloses applying bias power/high frequency power for biasing level to remove the portion 206/fence portion (col 3, lines 35-40)

Regarding claim 54, Yang discloses the step of reducing bias power (col 3, lines 44-45), which reads on switching the first power level to second power level.

Regarding claims 55-56, 58-59, Yang discloses using photoresist layer 204 as a mask to form a pattern at a dielectric (silicon dioxide) layer 202/ organic film on the substrate (col 2, lines 3-5; fig. 2A)

4. Claims 49-51, 60-62 are rejected under 35 U.S.C. 102(e) as being anticipated by Yang (US 6,218,084)

Yang discloses a method for removing photoresist layer 204 having an opening pattern, the layer 204 is used as a mask to etch an opening in the layer 202. This method comprises the steps of:

applying bias power/high frequency power for biasing to the wafer/substrate at a first power level (300 W) to strip/remove portion 206 formed during etching (col 3, lines 37-42)

generating/raising the processing gas to a plasma (col 3, lines 36-40)

stripping the photoresist layer 24 using an oxygen plasma when the bias power/high-frequency for biasing is applied to the substrate (col 3, lines 12-39), which

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reads on ashing the photoresist while applying the high frequency power for biasing to the workpiece

eliminating the bias power/high frequency power for biasing before removing the photoresist completely (col 3, lines 43-45),which reads on stopping the application of the high frequency bias power before removing the photoresist completely.

Regarding 50-51, 61-62, Yang discloses using photoresist layer 204 as a mask to form a pattern at a dielectric (silicon dioxide) layer 202/ organic film on the substrate (col 2, lines 3-5; fig. 2A)

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 41-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang et al (US 6,218,084) in view of Nguyen et al (US 6,043,164)

Yang discloses a method for removing photoresist layer 204 covering a layer 202 formed on a substrate placed in a chamber, the layer 202 has an opening 208 and a fence portion 206 expand/distending toward the upper portion and edge of the opening 208 (fig. 2A). This method comprises the steps of:

etching the substrate/workpiece to form an opening (col 3,lines 3-5)

applying bias power/high frequency power for biasing to the wafer/substrate at a first power level (300 W) to strip/remove portion 206/fence portion formed during etching (col 3, lines 37-42)

generating/raising the processing gas to a plasma (col 3, lines 36-40)

reducing the bias power/high frequency power for biasing to the wafer/substrate before completely removing the photoresist (col 3, lines 43-45)

Unlike the instant claimed inventions as per claims 41, 46, Yang does not specifically disclose switching the high-frequency bias power from the first power level to a lower second power level although Yang discloses reducing the high-frequency bias power.

However, Nguyen discloses a method for transferring a multilevel photoresist pattern comprises the step of reducing/ switching the high-frequency bias power from the first power level to a lower second power level before removing the photoresist completely (col 12, lines 14-20)

Since Yang discloses reducing the high-frequency bias power one skilled in the art would have found it obvious to modify Yang by reducing/ switching Yang's high-frequency bias power from the first power level to a lower second power level as per Nguyen because Nguyen states that during the step of lowering the bias power the resist covering the dielectric is completely removed (col 12, lines 17-21)

The limitations of claims 42, 43 has been discussed above.

Regarding claims 44, 45, 47, 48, Yang discloses using photoresist 204 as a mask to form a pattern at a dielectric (silicon dioxide) layer 202/ organic film on the substrate (col 2, lines 3-5; fig. 2A)

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Harafuji (US 5,635,021) discloses that bias power is an high -frequency power (col 32. lines 42-43)

Response to Arguments

8. Applicant's arguments filed on 1/31/2003 have been fully considered but they are not persuasive.

Applicant's argument that Berglund does not teach ashing the film with a first high-frequency biasing power because Berglund merely used DC biasing power level. This argument is unpersuasive because Berglund also teaches that " a high RF amplitude may be used to control DC bias 11" when etching to remove/ash photoresist layer 24 (col 4, lines 58-59). Thus, the examiner asserts that Berglund teaches ashing the film with a first high-frequency biasing power.

The applicants argue that Yang does not disclose " stopping application of the high-frequency power for biasing before the photoresist film becomes completely removed " The examiner disagrees because as recited in col 3, lines 38-46 of Yang, Yang clearly discloses applying a high frequency bias power on a wafer and " the bias power applied

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on the wafer can be reduced, and even eliminated" in a subsequent step to remove the photoresist film. Therefore, the examiner asserts that Yang discloses the step of "stopping application of the high-frequency power for biasing before the photoresist film becomes completely removed "

The applicants also argue that the examiner asserted motivation to combine Yang and Nguyen is clear since it is not clear why one skilled in the art is motivated to take teaching of Nguyen and incorporate it into the method of Yang especially when Yang and Nguyen utilizes different gases and operate under different operational characteristics. This argument is unpersuasive because the examiner does not rely on Nguyen for the teaching of the etching gases or operational characteristics. The examiner only relies on Nguyen for the teaching of reducing/ switching the high-frequency bias power from the first power level to a lower second power level before removing the photoresist. Since Yang also is concerned with the step of removing photoresist using high-frequency bias power, it is clear to one skilled in the art to incorporate Nguyen's teaching into the method of Yang especially states the advantage of using lower power level during the step of removing resist (paragraph 6).

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not

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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 703 305-6302. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and 703 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308-0661.


BENJAMIN L. UTECH
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LV
April 4, 2003